

**A Robot Arm Simulation with a Shared Memory
Multiprocessor Machine**

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Abstract

A parallel processing scheme for a single chain robot arm is presented for high speed computation on a shared memory multiprocessor. A recursive formulation that is derived from a virtual work form of the d'Alembert equations of motion is utilized for robot arm dynamics. A joint drive system that consists of a motor rotor and gears is included in the arm dynamics model, in order to take into account gyroscopic effects due to the spinning of the rotor. The fine grain parallelism of mechanical and control subsystem models is exploited, based on independent computation associated with bodies, joint drive systems, and controllers. Efficiency and effectiveness of the parallel scheme are demonstrated through simulations of a telerobotic manipulator arm. Two different mechanical subsystem models, i.e., with and without gyroscopic effects, are compared, to show the trade-off between efficiency and accuracy.